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**[Document Name] Abstract**

**[Abstract]** Transfer of the vibration to a basket room from a car frame is controlled effectively, and the levitation device of the elevator basket room floor which can raise the degree of comfort of an elevator is miniaturized, and it provides by low cost.

**[Elements of the Invention]** The longitudinal direction electromagnet 10 which acts perpendicularly between a car frame 2 and the basket room floor 4 put on this, Form the cross direction electromagnet 12 which acts horizontally, and the gap of the perpendicular direction between a car frame 2 and the basket room floor 4 [ with the longitudinal direction gap sensor 11 ] The cross direction gap sensor 14 detects a horizontal gap, respectively. The longitudinal direction acceleration sensor 15 and the cross direction acceleration sensor 16 detect vibration of horizontal and the perpendicular direction of the basket room floor 4, respectively. The electromagnetic force of electromagnets 10 and 12 is controlled so that vibration which a longitudinal direction and the cross direction electromagnet controllers 18 and 22 are delivered to the basket room floor 4 according to these detection outputs is controlled.

**[A selection figure] drawing 1**

[Translation done.]

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[Document Name] Description

[Title of the Invention] The levitation device of an elevator basket room floor

[Claim(s)]

[Claim 1] The elevator car frame which goes up and down along with a guide rail, and the basket room where it was prepared in this car frame, and the floor and the side-board part were formed in another object disengageable, The levitation device of the elevator basket room floor characterized by having the electromagnet which is prepared between the side-board part of the basket room attached to said car frame, and the floor of said basket room, and makes a non-contact state hold said floor by electromagnetic force to a car frame.

[Claim 2] The levitation device of the elevator basket room floor according to claim 1 characterized by having further the elastic body which supports said floor elastically at the time of un-driving of said electromagnet between the floor of said basket room, or a frame.

[Claim 3] The levitation device of the elevator basket room floor according to claim 1 characterized by said electromagnet consisting of a longitudinal direction electromagnet which is perpendicular and surfaces said floor, and a cross direction electromagnet which is horizontal and makes said floor estrange from a car frame.

[Claim 4] Said electromagnet is the levitation device of the elevator basket room floor according to claim 1 or 3 characterized by the thing of electromagnetic power of absorption and restitution arranged so that either may be used at least.

[Claim 5] The levitation device of the elevator basket room floor according to claim 1 or 3 characterized by having further the electromagnet control means which controls the electromagnetic force of said electromagnet and adjusts the gap of said floor and said car frame.

[Claim 6] Have further the gap sensor which detects the gap of said floor and said car frame, and [ said electromagnet control means ] The levitation device of the elevator basket room floor according to claim 5 characterized by controlling the electromagnetic force of said electromagnet so that vibration of said floor decreases according to the detection output from said gap sensor.

[Claim 7] It is the levitation device of the elevator basket room floor according to claim 5 which is further equipped with an oscillating detection means to detect vibration of said floor, and is characterized by said electromagnet control means controlling the electromagnetic force of said electromagnet so that vibration of said floor decreases according to the detection output from said oscillating detection means.

[Claim 8] Said oscillating detection means is the levitation device of the elevator basket room floor according to claim 7 characterized by consisting of an acceleration sensor.

[Claim 9] The levitation device of the elevator basket room floor according to claim 7 which is further equipped with the gain phase adjuster into which the detection output from said oscillating detection means is inputted, and is characterized by inputting the output of said gain phase adjuster into said electromagnet control means.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the levitation device of the basket room floor which surfaces the basket room floor prepared by dissociating with the side board of the riding cage of an elevator.

[0002]

[Description of the Prior Art] A basket room is installed in a car frame, makes it run a car frame along with a guide rail, and a basket room goes up and down it. For this reason, if the laying accuracy of a guide rail is bad, it will let a guide rail pass, and a motor torque ripple etc. will be transmitted to a basket room from a car frame through a rope, and a basket room will vibrate. In order to avoid this, elastic bodies, such as a rubber cushion, are arranged between the basket room lower part or the bottom of a frame, and, generally it is performed that mechanical oscillation is made not to be transmitted to a basket room. However, in order that the oscillation frequency transmitted to a riding cage from a rope or a guide idler might amount to tens of Hz from several Hz, it was difficult to attenuate all the vibration only with elastic bodies, such as a rubber cushion. Therefore, various methods are proposed from the former. Into this, a rubber cushion and an electromagnet which are indicated by JP,S63-306183,A, for example are put side by side, the method controlled so that an electromagnet is driven actively and transmitted vibration is negated, or the basket [ like ] currently indicated by JP,H1-156293,A -- there is a method which surfaces the whole chamber from a car frame.

[0003]

[Problem to be solved by the invention] However, [ are controlling by the former method so that an electromagnet is laid on a rubber cushion, vibration transmitted to a rubber cushion and vibration of antiphase are given and vibration is not transmitted to a basket room side, but ] On mechanical composition, since the basket room is connected with the car frame by the rubber cushion after all, vibration will be inevitably transmitted from a rope or a guide idler. Moreover, by the latter method, since a car frame is followed and a basket room also vibrates, transfer of vibration can be reduced greatly, but sufficient oscillating reduction effect cannot be acquired to vibration of low frequency. moreover, a basket with heavy weight -- in order to surface the whole chamber, the big energy for floatation is needed, equipment becomes large, and, naturally cost also becomes high. Anyway, the dissatisfaction remains in the point of a degree of comfort.

[0004] This invention was made in view of the actual condition of such conventional technology, and that 1st purpose controls effectively transfer of the vibration to a basket room from a car frame, and there is in proposing the levitation device of the elevator basket room which can offer an elevator comfortable to ride in. Moreover, the 2nd purpose makes this levitation device small, and there is in providing by low cost.

[0005]

[Means for solving problem] The elevator car frame which this invention goes up and down along with a guide rail in order to attain the above-mentioned purpose, The basket room where it was prepared in this car frame, and the floor and the side-board part were formed in another object disengageable, It is prepared between the side-board part of the basket room attached to said car frame, and the floor of said

basket room, and is characterized by having the electromagnet which makes a non-contact state hold said floor by electromagnetic force to a car frame.

[0006] In this case, said electromagnet is perpendicular and it is desirable to constitute from a longitudinal direction electromagnet which surfaces said floor, and a cross direction electromagnet which is horizontal and makes said floor estrange from a car frame. Moreover, said electromagnet is good to constitute so that electromagnetic force can be controlled by an electromagnet control means, and to control the gap of said floor and said car frame. In order to control a gap, it is good to form further the gap sensor which detects the gap of said floor and said car frame. And the detection output of this gap sensor is taken into said electromagnet control means, and the electromagnetic force of said electromagnet can be controlled so that vibration of said floor decreases. Furthermore, an oscillating detection means to detect vibration of said floor is established further, and said electromagnet control means can control the electromagnetic force of said electromagnet so that vibration of said floor decreases according to the detection output from said oscillating detection means.

[0007]

[Function] If constituted as mentioned above, according to the electromagnetic force of an electromagnet, space can be separated from a car frame and the floor of a basket room can be supported. By this, a mechanical vibration directly transmitted from the car frame and guide rail side can be reduced substantially. Moreover, an electromagnet control means takes in the detection output from a gap sensor, a signal detection means, etc., and controls the electromagnetic force of an electromagnet to reduce vibration of a floor. Vibration felt for the PAX of the basket interior of a room decreases substantially, and improvement in a degree of comfort is achieved by this. Moreover, since the weight of the floor of a basket room and only the PAX's weight are required, making it rise to surface also has little energy which is small also as for equipment and consumes it, and it ends.

[0008]

[Working example] With reference to Drawings, the work example of this design is explained hereafter. Drawing showing the detail of the levitation device of the basket room of the elevator which drawing 1 requires for a work example, and drawing 2 are drawings showing the outline composition of a car frame and a levitation device for a basket room. In drawing 2, the basket room 1 of an elevator is formed in a car frame 2, and the rope 3 is connected with the upper part of the car frame 2. With the rope 3 concerned, a car frame 2 is hung, is attached to the guide rail which is not illustrated, and runs along with the guide rail concerned. The basket room 1 consists of a basket room floor (floor) 4 and a basket room side board (side-board part) 5, and both of each other are separated movable.

[0009] The rubber cushion 7 which becomes the sole plate 6 of a car frame 2 from an elastic body is

installed, and on it, as shown in drawing 1, the bottom support plate 8 of the basket room side board 5 is being laid and fixed. In other words, the bottom support plate 8 protrudes horizontally from the bottom of the basket room side board 5, and the bottom support plate 8 is attached on the rubber cushion 7. And the basket room floor 4 is located on the bottom support plate 8. From the basket room floor 4, the bottom support plate 8 of the basket room side board 5 is crossed, and the bracket (a "longitudinal direction bracket" is called hereafter.) 9 of the type of side view KO is installed so that drawing 1 may show. On the horizontal part 9a of this longitudinal direction bracket 9 bottom, the gap sensor (a "longitudinal direction gap sensor" is called hereafter.) 11 which detects a gap with the sole plate 6 of the electromagnet (a "longitudinal direction electromagnet" is called hereafter.) 10 which acts perpendicularly, or a frame 2 is formed. Moreover, the bracket (a "cross direction bracket" is called hereafter.) 13 which supports the electromagnet (a "cross direction electromagnet" is called hereafter.) 12 which acts horizontally is installed in the part which counters the vertical portion of said bracket 9 of the sole plate 6 of a car frame 2 from an outside. The gap sensor (a "cross direction gap sensor" is called hereafter.) 14 which detects a gap with said longitudinal direction bracket 9 further is formed in this cross direction bracket 13. The acceleration sensor ("the following and "longitudinal direction acceleration sensor" are called.) 15 which detects vertical acceleration other than said longitudinal direction bracket 9, and the acceleration sensor (a "cross direction acceleration sensor" is called hereafter.) 16 which detects horizontal acceleration are installed in the basket room floor 4.

[0010] The output of said longitudinal direction acceleration sensor 15 is inputted into the gain phase adjuster (a "longitudinal direction gain phase adjuster" is called hereafter.) 17, and the output is inputted into the electromagnet controller (a "longitudinal direction electromagnet controller" is called hereafter.) 18 as an electromagnet control means. Moreover, the detection output of the longitudinal direction gap sensor 11 is added with the instruction output and adder 20 (a "longitudinal direction adder" is called hereafter.) from the gap instruction part (a "longitudinal direction gap instruction part" is called hereafter.) 19, and is inputted into the longitudinal direction electromagnet controller 18. And the control signal from this longitudinal direction electromagnet controller 18 to the longitudinal direction electromagnet 10 is outputted.

[0011] Similarly, the output of said cross direction acceleration sensor 16 is inputted into the cross direction gain phase adjuster 21, and the output is inputted into the cross direction electromagnet controller 22. Moreover, the detection output of the cross direction gap sensor 14 is added with the instruction output and the cross direction adder 24 from the cross direction gap instruction part 23, and is inputted into the cross direction electromagnet controller 22. And the control signal from this cross direction electromagnet controller 18 to the cross direction electromagnet 12 is outputted. In addition, each composition member containing the electromagnets 10 and 12 of these directions in every direction is prepared symmetrically with the both sides of the basket room floor 4. In addition, it cannot be overemphasized that each of these composition members may be prepared in the portion corresponding to four corners of the basket room floor 4.

[0012] It did not energize on the longitudinal direction electromagnet 10, but with the levitation device

constituted in this way, in the state where electromagnetic force does not occur, the gap delta 1 between the basket room floor 4 and the rubber cushion 7 became zero, and the basket room 1 and the frame 2 have touched through the rubber cushion 7 conventionally like equipment. That is, the basket room 1 is supported by the car frame 2 through the rubber cushion 7. Therefore, the usual run operation can be carried out also in the state where the longitudinal direction electromagnet 10 is not driven.

[0013] On the other hand, if it energizes on the longitudinal direction electromagnet 10 and predetermined electromagnetic force is generated with the longitudinal direction electromagnet controller 18 The longitudinal direction electromagnet 10 attracts the sole plate 6 of a car frame 2, the longitudinal direction bracket 9 moves so that it may balance with the load added to the weight of the basket room floor 4, and the basket room floor 4, and the gap delta 2 of the sole plate 6 of a car frame 2 and the longitudinal direction electromagnet 10 changes. The basket room floor 4 estranges and surfaces from the rubber cushion 7 by this, and in other words, a gap delta 1 arises between the bottom support plate 8 and the basket room floor 4 between the bottom support plate 8 of the basket room side board 5 of the upper surface of the rubber cushion 7, and the longitudinal direction bracket 9. Thus, since the basket room floor 4 is mechanically separated from the basket room side board 5 and a car frame 2, transfer of vibration is reduced. Furthermore, if the power of absorption of the longitudinal direction electromagnet 10 is controlled so that said gap delta 2 becomes fixed to the load change of the basket room floor 4, the basket room floor 4 is stabilized and vibration can also be controlled effectively. For this reason, said longitudinal direction gap sensor 11 and the longitudinal direction acceleration sensor 15 are formed, and control the power of absorption of the longitudinal direction electromagnet 10 based on vibration of the gap delta 2 and longitudinal direction which were detected.

[0014] Namely, the instruction value of a target gap [ part / 19 / longitudinal direction gap instruction ], The detection value of the actual gap delta 2 with the sole plate 6 of a car frame 2 is inputted into the longitudinal direction adder 20, and according to the deflection, the longitudinal direction electromagnet controller 18 controls the electromagnetic force of the longitudinal direction electromagnet 10 so that a gap delta 2 becomes said desired value. Moreover, the longitudinal direction acceleration sensor 15 detects fine vibration of the basket room floor 4, this detection signal is given to the longitudinal direction electromagnet controller 18, and the longitudinal direction electromagnet controller 18 controls the electromagnetic force of the longitudinal direction electromagnet 10 to negate vibration of the basket room floor 4. For this reason, vibration of the basket room floor 4 can be reduced effectively. Moreover, in order to make abatement of this vibration more effective, in this work example, the longitudinal direction gain phase adjuster 17 is formed between the longitudinal direction electromagnet controllers 18 from the longitudinal direction acceleration sensor 15. Thus, if the longitudinal direction gain phase adjuster 17 is formed and the constant of the longitudinal direction gain phase adjuster 17 will be set up proper, the signal of the basket room floor 4 can be reduced more effectively. In addition, the constant of the longitudinal direction gain phase adjuster 17 is changed according to the load of the basket room floor 4, the run position of a riding cage, etc. By constituting in this way, vibration of the basket room floor 4 is more certainly reduced to vibration which changes on condition of the PAX's manpower or rope length.



[0015] If it is made above, a vertical vibration can be effectively reduced with the longitudinal direction electromagnet 10, but to a horizontal vibration, it is unstable. Then, in order to suppress a horizontal vibration, the same rubber cushion as the above may be installed between the basket room floor 4 or a frame 2, but vibration cannot be effectively attenuated for the same Reason as the above-mentioned. So, in this work example, the longitudinal direction electromagnet 10 and the same cross direction electromagnet 12 are formed in the car frame 2 side. And the same cross direction gap sensor 14 as each component used for the vibration control of a longitudinal direction, the cross direction acceleration sensor 16, the cross direction gain phase adjuster 21, the cross direction gap instruction part 23, and the cross direction adder 24 are formed. A horizontal vibration is controlled perpendicularly similarly with the gap delta 3 and the cross direction acceleration sensor 16 of a car frame 2 and the longitudinal direction bracket 9 by the side of the basket room floor 4.

[0016] In addition, although the sole plate 6 of the basket room side board 5 is fixed on the rubber cushion 7, the basket room side board 5 is fixed to a car frame 2, and you may make it surface the basket room floor 4 from a car frame 2 in this work example. However, it cannot be denied in this case that vibration of the basket room side board 5 becomes large.

[0017] Drawing 3 is the important section enlarged drawing showing other work examples. While countering and forming the longitudinal direction electromagnet 10 in this work example in both the sole plate 6 of a car frame 2, and the basket room floor 4 It is what counters and forms the cross direction electromagnet 12 in both inner surfaces of the suspension part 4a of the basket room floor 4, or a frame 2, and controls the longitudinal direction gap delta 2 and the cross direction gap delta 3 like the above-mentioned work example. Each other components only consist of differing from said work example in that the restitution of the electromagnet which counters is used on a par with said work example. In addition, it is the problem of selection whether the power of absorption of electromagnets 10 and 12 is used or restitution is used, and it cannot be overemphasized that a method may be changed in a longitudinal direction and a cross direction, respectively.

[0018] Floatation control of the levitation device constituted in this way is performed to timing as shown drawing 4. This timing chart indicates the timing of the magnetization period of an electromagnet to be the switching action of a door, and rise-and-fall operation of a basket, and in Example 1, it magnetizes only during rise-and-fall operation without the opening-and-closing time of a door magnetizing electromagnets 10 and 12 in consideration of energy saving. Example 2 magnetizes electromagnets 10 and 12 according to the timing of opening of a door, and stops magnetization of electromagnets 10 and 12 according to the timing of the completion of closing of a door. In addition, in Example 2, although united with door opening and door stoppage, you may set up the timing of a magnetization start and a magnetization stop during opening and stoppage operation. Anyway, when operation of an elevator has stopped, magnetization of electromagnets 10 and 12 is not performed, but power-saving of the part is attained.

[0019]

[Effect of the Invention] By old description, according to this invention constituted as mentioned above, there are the following effects so that clearly.

[0020] Since the floor of a basket room can hold the state where a car frame is not contacted according to invention according to claim 1 which constitutes the floor and side-board part of a basket room disengageable on another object, and makes a non-contact state hold only a floor to a car frame with an electromagnet Transfer of mechanical oscillation can be controlled and an elevator comfortable to ride in can be offered by this. moreover -- since what is necessary is just to support an electromagnet to that of the weight of the PAX who joins the floor and this floor of a basket room -- a basket -- there is also little electric power consumed while equipment is also small, it ends and cost becomes cheap compared with what surfaces the whole chamber, it ends, and energy saving can be attained.

[0021] [ according to invention according to claim 2 further equipped with the elastic body which supports the floor concerned elastically when said floor contacts the car frame side between the floor of a basket room, or the frame ] Since what is necessary is just to make an elastic body support a floor at the time of un-operating [ which vibration is delivered ], without driving an electromagnet, in addition to an effect of the invention according to claim 1, energy saving can be attained further.

[0022] [ according to invention according to claim 3 constituted from a longitudinal direction electromagnet which is perpendicular in an electromagnet and surfaces said floor, and a cross direction electromagnet which is horizontal and makes said floor estrange from a car frame ] In addition to an effect of the invention according to claim 1, certainly, a floor can be made to be able to estrange from a car frame, and can be surfaced, and transfer of vibration can be controlled more certainly.

[0023] [ an electromagnet / according to invention of electromagnetic power of absorption and restitution according to claim 4 arranged so that either may be used at least ] Since the method of arrangement of an electromagnet or an operation can be suitably chosen according to the mechanical physical relationship and the size relations between a floor and a side-board part, and a car frame of a basket room, in addition to an effect of the invention according to claim 1 or 3, the flexibility of a design becomes large.

[0024] Since vibration which controls the gap of a gap and is transmitted to a floor is controlled positively according to invention according to claim 5 which is further equipped with the electromagnet control means which controls the electromagnetic force of an electromagnet, and controlled the gap with a floor or a frame In addition to an effect of the invention according to claim 1 or 3, vibration can be controlled further.

[0025] It has further the gap sensor which detects a gap with a floor or a frame. [ an electromagnet control means / according to invention according to claim 6 which controls the electromagnetic force of said electromagnet so that vibration of said floor decreases according to the detection output from said gap sensor ] Since change of a gap is detected, an electromagnet is controlled by a gap sensor according to this change and vibration of a floor is reduced with it, the depression effect of vibration of invention according to claim 5 can be raised further.

[0026] [ have further an oscillating detection means to detect vibration of a floor, and / an electromagnet control means / according to invention according to claim 7 which controls the electromagnetic force of said electromagnet so that vibration of said floor decreases according to the detection output from said oscillating detection means ] Since the state of vibration is detected, an electromagnet is controlled by an oscillating detection means according to this and vibration of a floor is reduced, the depression effect of vibration of invention according to claim 5 can be raised further.

[0027] According to invention according to claim 8 which constituted the oscillating detection means with the acceleration sensor, vibration is certainly detectable with easy composition.

[0028] [ according to invention according to claim 9 the detection output from an oscillating detection means is further equipped / invention / with the gain phase adjuster inputted, and it was made to make the output of said gain phase adjuster input into said electromagnet control means ] Since control of the electromagnet which changed the constant according to the state of vibration and suited the mode of vibration further with the gain phase adjuster is attained, the depression effect of vibration becomes remarkable rather than invention according to claim 7.

#### [Brief Description of the Drawings]

[Drawing 1] It is drawing showing the outline structure of the basket room floor levitation device of the elevator concerning the work example of this invention.

[Drawing 2] It is drawing showing the relation between the car frame of an elevator and basket room concerning a work example, and a levitation device.

[Drawing 3] It is drawing showing the structure of the elevator basket room floor levitation device pavement object concerning other work examples of this invention.

[Drawing 4] It is the timing chart which shows the driving timing of the levitation device concerning a work example.

[Explanations of letters or numerals] 1 Basket Room 2 Car Frame 3 Rope 4 Basket room floor (floor) 4a The suspension part 5 of a basket room floor Basket room side board (side-board part) 6 The sole plate 7 of a car frame Rubber cushion 8 The bottom support plate 9 of a basket room side board Longitudinal direction bracket 10 The longitudinal direction electromagnet 11 Longitudinal direction gap sensor 12 The cross direction electromagnet 13 Cross direction bracket 14 The cross direction gap sensor 15 Longitudinal direction acceleration sensor 16 The cross direction acceleration sensor 17 Longitudinal direction gain phase adjuster 18 Longitudinal direction electromagnet controller 19 Longitudinal direction gap instruction part 20 Longitudinal direction adder 21 Cross direction gain phase adjuster 22 Cross direction electromagnet controller 23 Cross direction gap instruction part 24 Cross direction adder

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[Translation done.]